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TECHNICAL MEMORANDUM

AMBIENT AIR QUALITY SURVEY IN THE VICINITY OF PPG CANADA LIMITED AND LAWSON GRAPHICS LIMITED BROWN'S LINE AND LAKESHORE BOULEVARD, TORONTO AUGUST, 1986

ARB-033-87-AQM

April, 1987

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Ministry
of the
Environment

E. PICHÉ, Director
Air Resources Branch

Ref. 70790

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Prepared for

The Central Region
Ministry of Environment

Air Resources Branch
Ministry of Environment

April, 1987

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EXECUTIVE SUMMARY

Between August 12 and 21, 1986, Mobile Air Monitoring Unit #1 of the Air Resources Branch undertook an ambient air quality survey in the vicinity of PPG Canada Limited and Lawson Graphics Limited in the Lakeshore Blvd./Brown's Line area of Toronto. The main aims of this survey were to monitor gaseous emissions expected to have originated from these two suspected sources and to establish the general air quality parameters of this area .

From all of the ambient air data acquired downwind of these two suspected sources, the ground level concentrations of the measured contaminants were all less than Ontario's criteria for desirable air.

The air quality data acquired during the overnight and other long-term monitoring at Christ the King Catholic School were indicative of a typical urban environment. Ground level concentrations of oxides of nitrogen (NOx) were found to be elevated. Nitrogen oxides include both nitrogen dioxide (NO_2), which is a health concern, and comparatively non-toxic nitric oxide (NO). The monitoring of nitrogen dioxide levels indicated that the Desirable Ambient Air Quality Criterion of 0.20 ppm for a one-hour average concentration was met throughout the sampling periods. Ambient 1\2-hour measurements of oxides of nitrogen (NOx) were as high as 0.52 ppm. Currently there is no multilple source (ambient) oxides of nitrogen (NOx) standard which could be applied in areas of heavy traffic such as the monitored area in this survey. The single source 1\2-hour point-of-impingement standard for oxides of nitrogen (NOx), calculated as an equivalent concentration of nitrogen dioxide (NO_2), is 0.25 ppm.

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BACKGROUND

In March of 1986, Mr. Kawasaki of the Central Region submitted a letter to Dr. A. Egbert of the Public Health Department of the City of Etobicoke stipulating that the Ministry had conducted a survey and inventory review of the hydrocarbon compounds used at PPG Canada Ltd., Lawson Graphics Ltd. and Burmah-Castrol Ltd. in the Brown's Line and Lakeshore Blvd area of Toronto. As a result of this correspondance and subsequent meetings, the Air Resources Branch was requested to undertake Air Quality Monitoring in the vicinity of Christ the King Catholic School with special emphasis to be placed on gaseous emissions expected to be originating from PPG Canada Limited and Lawson Graphics. As noted in this original correspondance, the five main hydrocarbon compounds of interest were styrene, toluene, xylenes, ethyl benzene and methylene chloride (also known as dichloromethane). Mobile Air Monitoring Unit #1 (MAMu#1) has the capabilities of doing these measurements (as can be seen from Tables #1 and #2) and thus was requested to undertake this study. The second and third weeks of August were slated for this study and the particulars were forwarded to the Regional office in May.

RESULTS, DISCUSSION and OBSERVATIONS

The First Week

Tuesday, August 12

MAMu#1 moved into the Brown's Line/Lakeshore Blvd area in the late afternoon and set up at Christ the King Catholic School. Here on shoreline electrical power, all instruments were calibrated and nighttime measurements for the common contaminants were initiated. A high pressure area was situated over the Toronto area and thus the early evening was clear with light and variable winds. Poor dispersion conditions existed and as noted by the meteological parameters, a slight nocturnal inversion existed later that night. For the common contaminants (i.e. Carbon Monoxide (CO), Total Reduced Sulphur Compounds (TRS), Sulphur Dioxide (SO_2), Total Hydrocarbon Compounds (THC), Non-Methane Hydrocarbon Compounds (Non-CH_4 or TH-M), Methane (CH_4), Oxides of Nitrogen (NOx), Nitrogen Dioxide (NO_2), nitric oxide (NO), and Ozone (O_3)), monitored during this overnight period, only the ground level concentrations (glc's) of NOx were found to be elevated. The maximum half-hour concentration for NOx was found to be 0.52 ppm (parts per million). Since this elevated glc was acquired under poor atmospheric dispersion conditions, the source(s) of this contaminant could not be identified. (please refer to Table #3)

Wednesday, August 13

Because of the aforementioned high pressure area, the air mass was dry and stable and very little cloud cover existed. The only breeze was due to the lake effect which materialized after 11 am. Prior to that time and while MAMu#1 was still on shoreline power at the school; the nighttime monitoring was ended; all instrumentation was recalibrated; an upwind 30-minute gas chromatographic (GC) sample was acquired; and the daily monitoring programme was decided. After 11am, the winds were southeasterly and relatively light (5 to 7 km/hr). MAMu#1 was moved to the Chrysler southwest corner parking lot and was positioned directly downwind of PPG Canada Limited. Although the wind dynamics clearly stipulated that this site was directly downwind of PPG Canada Limited, the environment staff only perceived a very slight odour at this time. Nevertheless, commencing at 11:31am, 4 hours of common contaminant data and four 30-minute GC samples were acquired (approximately one every hour) at this site.

For the common contaminant data monitored downwind of this source, no applicable Environmental Standard (specifically the 1/2-hour point-of-impingement standard) was exceeded as the respective maximum half-hour (MHH) average glc's of CO, SO_2, THC and NOx were only 1.94, 0.009, 3.77 and 0.11 ppm (parts per million).

From the four downwind GC samples, 45 to 58 different organic compounds were detected and the average total hydrocarbon loading was only 409 micrograms per cubic metre (ug/m3) with the aromatic fraction accounting for 60% (246 ug/m3) of this total and the alkane fraction 35% (145 ug/m3). For the five targeted organics, no methylene chloride was detected (i.e. its concentration was deemed to be less than 0.5 ug/m3) in any of these samples, and the averaged concentrations of toluene was only 31 ug/m3 (its Environmental Standard is 2,000 ug/m3), of ethylbenzene 29 ug/m3 (its Environmental Standard is 4,000 ug/m3), of xylenes 120 ug/m3 (its Environmental Standard is 2,300 ug/m3) and of styrene 5 ug/m3 (its Environmental Standard is 400 ug/m3). Apart from the aforementioned, the only other major aromatic detected in these GC samples was benzene and from the downwind samples, its average loading was 9 ug/m3 (its Environmental Standard is 10,000 ug/m3).

From the morning upwind GC sample, the total hydrocarbon loading was 228 ug/m3 with an alkane fractional loading of 155 ug/m3 (68%) and aromatic loading of 45 ug/m3 (20%). From this sample, no styrene or methylene chloride were detected and the respective loadings of toluene, ethylbenzene, and xylenes were 15, 3, and 10 ug/m3. For the other dominant aromatic, benzene, its loading was only 5 ug/m3.

Two points that should be stressed for the results obtained by the GC analyses on this date are that (1) the targetted organics were the major aromatic organics detected in the GC samples and (2) for all of the organic compounds detected , all measured concentrations were very low and no applicable Environmental Standard was exceeded. All of these results are presented Tables #3 and #4.

After 3:45 pm, MAMu#1 moved back to Christ the King Catholic School and set up on shoreline power in order to do overnight monitoring for the common contaminants. Because of the high pressure system still over Toronto and the dry and stable air mass, very little cloud cover was expected overnight and a nocturnal inversion was expected. This was the case as noted by the meteorological parameters, however the glc's of the measured common contaminants were still very low. The MHH average glc's of CO, TRS, THC and NOx were 1.41, 0.003, 3.26, and 0.07 ppm respectively.

Thursday, August 14

Due to unforeseen commitments by the Air Resources Branch, MAMu#1 was pulled from this survey during Thursday morning. However on Monday August 18th, MAMu#1 was again available and the survey continued.

The Second Week

Monday, August 18

During late Sunday evening, a cold front pushed through the Toronto area. By the afternoon of August 18th, it was hot, hazy and humid in the Brown's Line/Lakeshore Blvd area. A light lake breeze was present and MAMu#1 moved to the Chrysler plant southwest parking lot and was positioned directly downwind of PPG Canada Limited.

As usual before any monitoring is even attempted, the operational status of the plant is ascertained. On this date and at this time, a large roofing/tarring opertion was being carried out at PPG Canada Limited. Because of the emissions from this operation, the proposed monitoring programme could not be followed. MAMu#1 returned to the School and was prepared for overnight monitoring.

Because of this roofing operation, no more monitoring could be undertaken with respect to PPG Canada Limited and thus an investigation of emissions from Lawson Graphics was undertaken for the remainder of the week. The news of this roofing operation was passed to the Branch and the Region with a statement regarding the continuance of monitoring in this area. Mr. D. Hahn, of the Regional office, contacted PPG and was told that the roofing operation would end on August 19th (it finally did end on August 21nd, the last allotted day for this survey).

From the data acquired overnight on August 18, poor atmospheric dispersion conditions were evident and elevated glc's for the common contaminants were recorded. The respective MHH average glc's of CO, TRS, THC, NOx, and O_3 were 1.73, 0.010, 3.72, 0.295 and 0.08 ppm. The source(s) of these higher concentrations of NOx could not be identified. The major component of the NOx was NO (its MHH average was 0.21 ppm).

Tuesday, August 19

A quasi-stationary northeast-southwest orientated ridge of high pressure was situated over Sault Ste. Marie on this date and because of this weather system, the air mass in Toronto was dry and stable with reported light and variable winds.

Just before noon, MAMu#1 moved to the Lakeshore Blvd, just south of Lawson Graphics. The winds had become moderate at this time (due to the lake breeze effect - from the southeast at 20 km/hr) and this position was deemed to be upwind of Lawson Graphics. One 30-minute GC sample and approximately 30-minutes of common contaminant data were acquired at this time. As can be seen from the acquired results, both the GC results and the common contaminant concentrations were elevated and were indicative of vehicular exhaust emissions. Over 60 different organics were detected in the GC sample and the total hydrocarbon loading was 784 ug/m3 with essentially equal loadings from the alkane and aromatic fractions. The respective MHH average glc's of CO and THC were 17.55 and 3.85 ppm.

Just before 1pm, MAMu#1 moved to the southeast corner of the Chrysler plant and stopped at a location that was deemed to be directly downwind of Lawson Graphics Limited. Although the wind dynamics clearly pointed to Lawson Graphics as being directly upwind, no odour was perceived by the Environment staff at this location . Nevertheless, three 30-minute GC samples and approximately 2.5 hours of common contaminant data were acquired. From this data, all concentrations were found to be very low or at trace levels. For example, the respective MHH average glc's for CO, TRS, THC and NOx were 0.33, 0.004, 2.28 and 0.04 ppm and for the GC samples, the total hydrocarbon loadings ranged from 75 to 182 ug/m3 (for an average loading of 142 ug/m3) with essentially equal contributions from the alkane and aromatic fractions (averaged 69 and 62 ug/m3 respectively). For the targeted organic compounds, no methylene chloride or styrene were detected and only trace amounts of toluene (12ug/m3), ethylbenzene (3ug/m3), benzene (4ug/m3) and xylenes (16ug/m3) were measured.

After 4pm, MAMu#1 moved back to the School and set up for overnight monitoring. Only common contaminant monitoring was undertaken and as can be seen from the results, significant concentrations were measured. The respective MHH average glc's for CO, TRS, THC and NOx were found to be 2.09, 0.003, 4.08 and 0.336 ppm. It is worthwhile to note that this was the third episode of elevated oxides of nitrogen concentrations and on all occasions, the results were obtained under poor dispersion conditions, had a higher than usual NO component and were measured during the early morning hours.

Wednesday, August 20

On this day, the winds were southeast and light. The roofing operation was still going on at PPG and after a cursory investigation of other possible monitoring sites and sources in the area, it was decided to do a recalibration of the analyzers in MAMu#1 and to remain at Christ the King Catholic School. MAMu#1 was set up to do long term monitoring and just before 1pm, the monitoring commenced.

Thursday, August 21

At just before noon, the overnight monitoring programme was ended and the resulting data was again indicative of poor atmospheric dispersion conditions. The respective MHH average glc's of CO, THC, SO_2, and NOx were 1.72, 3.49, 0.007, and 0.22 ppm..

Further investigations during this morning revealed that the roofing operation was still going on at PPG and thus it would be futile to do any more air quality monitoring in this area. MAMu#1 left this area just before noon and this survey was thus terminated.

SUMMARY

From the two weeks allotted for this air quality survey in the Brown's Line/ Lakeshore Blvd area, only two active monitoring days were obtained; one day downwind of PPG Canada Limited and one day downwind of Lawson Graphics Limited. For the remainder of the time, long term and overnight monitoring was undertaken at Christ the King Catholic School.

The reason for obtaining only two active monitoring days during this time was the fact that during the start of the second week, PPG Canada Limited undertook an extensive roof tarring operation and the emmisions for this operation completely masked any and all gaseous emissions that were expected to have originated from this plant and all gaseous contaminants that were deemed to be ubiquitous of this downtown area. Thus this roofing operation prematurely terminated the air quality survey in this area.

For the air quality data acquired downwind of PPG Canada Limited, no applicable Environmental Standards were exceeded. For the five targeted organic compounds, the average loadings were very low; no methylene chloride was detected in any of the GC samples and the average loadings of toluene, styrene, xylenes and ethylbenzene were only 31, 5, 120 and 29 ug/m3 (micrograms per cubic metre) respectively. On the average, the aromatic fraction was double that of the alkane fraction and together they comprised over 95% of the total hydrocarbons detected in these downwind samples.

Similarily, no applicable Environmental Standards were exceeded for any of the air quality data acquired downwind of Lawson Graphics Limited. The three acquired GC samples were even cleaner than those acquired downwind of PPG Canada Limited and the concentrations were deemed to be at trace levels. For the targeted organic compounds, no styrene or methylene chloride was detected and the averaged loadings of toluene, xylenes and ethylbenzene were only 12, 16 and 3 ug/m3 respectively. The total hydrocarbon loadings were decreased by a factor of two (as compared to the results obtained downwind of PPG) and now the alkane and aromatic fractional loadings were about equal.

The air quality data acquired during the overnight and other long-term monitoring at Christ the King Catholic School were indicative of a typical urban environment. For all of the common contaminants monitored, only the ground level concentrations of oxides of nitrogen were found to be elevated. The maximum half-hour average ground level concentration measured for this contaminant was 0.52 ppm. These higher results were always obtained during the early morning hours, before sunrise, and under poor atmospheric dispersion conditions when no clear delineation of source(s) could be ascertained. Nitrogen oxides (NOx) include both nitrogen dioxide (NO2), which is a health concern, and comparatively non-toxic nitric oxide (NO). The monitoring of nitrogen dioxide levels indicated that the Desirable Ambient Air Quality Criterion of 0.20 ppm for a one-hour average concentration was met throughout the sampling periods. Currently there is no multilple source (ambient) oxides of nitrogen (NOx) standard which could be applied in areas of heavy traffic such as the monitored area in this survey. The single source 1\2-hour point-of-impingement standard for oxides of nitrogen (NOx), calculated as an equivalent concentration of nitrogen dioxide (NO_2) is 0.25 ppm. For the gas chromatographic data acquired at this site, low hydrocarbon loadings were obtained.

Area Map and Monitoring Sites

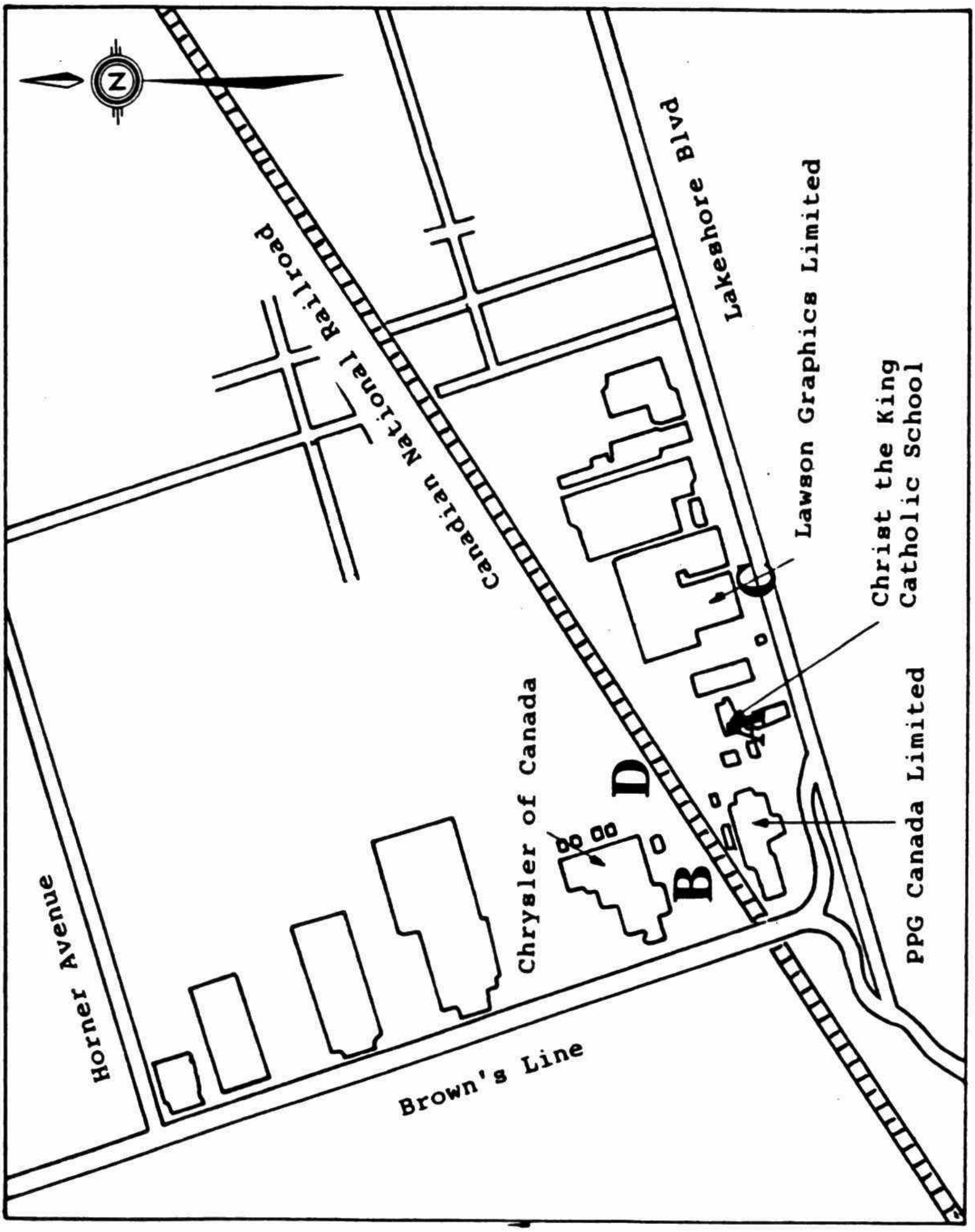


TABLE #1

THE INSTRUMENTATION OF MOBILE AIR MONITORING UNIT #1

Instrument	Manufacturer	Analytical Technique	Full Scale Sensitivity
THC, CH_4, TH-M analyzer	Ingenieur-Produktions-Gruppe Munchen (IPM) RS-t	Dual flame ionization	50 ppm THC (as CH_4)
H_2S, SO_2, NO_x sources	Hartmann & Braun Prufgasgenerator	N/A	N/A
TRS/SO_2 analyzer	Monitor Labs 8850 c/w ML 8770	Fluorescence	1.0 ppm SO_2 0.5 ppm TRS
NO_x, NO_2, NO analyzer	Monitor Labs 8840	Chemi-Luminescence	1.0 ppm NO_x (as NO_2)
CO analyzer	Thermo Electron P48	Gas Filter Correlation	100 ppm CO
O_3 analyzer/ source	Dasibi 1003-AAS	UV Absorption	1.0 ppm O_3
CO & THC sources	Matheson	Compressed Gas	N/A
Gas Chromatograph	HP 5880 Dual Capillary Column	Flame Ionization Det.	as set per calibrations

Meteorological Instrumentation

Instrument	Manufacturer	Scale
** Wind speed	Lambrecht GmBH	km/hr
** Wind direction	Lambrecht GmBH	degrees
Temperature	Weather Measure (WM) T621	degrees Celsius
Humidity	WM-HM-11P	absolute & %
Barometric pressure	WM-BM70-B242	millibars
Solar Radiation	WM Star Pyranometer	milliwatts/cm2

** These instruments are located on top of a 10 metre retractable tower

TABLE #2

CHEMICAL COMPOUND LIST FOR MOBILE AIR MONITORING UNITS #1 AND #2

ALKANES

ETHANE
PROPANE
2-METHYLPROPANE
BUTANE
2-METHYLBUTANE
PENTANE
2,2-DIMETHYLBUTANE
2,3-DIMETHYLBUTANE
2-METHYLPENTANE
3-METHYLPENTANE
HEXANE
2-METHYLHEXANE
2,3-DIMETHYLPENTANE
3-METHYLHEXANE
2,2,4-TRIMETHYLPENTANE
HEPTANE
2,5-DIMETHYLHEXANE
2-METHYLHEPTANE
4-METHYLHEPTANE
3-METHYLHEPTANE
OCTANE
4-METHYLOCTANE
2-METHYLOCTANE
3-METHYLOCTANE
NONANE
DECANE
UNDECANE
DODECANE

CYCLOALKANES

CYCLOPROPANE
CYCLOPENTANE
METHYLCYCLOPENTANE
CYCLOHEXANE
METHYLCYCLOHEXANE
TRANS12DIMETHYLCYCLOHEXANE
PROPYLCYCLOPENTANE
cis-1,2-DIMETHYLCYCLOHEXANE
ETHYLCYCLOHEXANE
tert-BUTYLCYCLOHEXANE
BUTYLCYCLOHEXANE

COMMON CONTAMINANTS

TOTAL REDUCED SULPHUR COMPOUNDS
SULPHUR DIOXIDE
CARBON MONOXIDE
OXIDES OF NITROGEN (NOx, NO2 AND NO)

UPPER AIR MINISONDE SOUNDINGS

ALKENES

PROPADIENE
1-BUTENE
1,3-BUTADIENE
3-METHYL-1-BUTENE
1-PENTENE
2-METHYL-1,3-BUTADIENE
TRANS-2-PENTENE
cis-2-PENTENE
2-METHYL-2-BUTENE
4-METHYL-1-PENTENE
3-METHYL-1-PENTENE
1-HEXENE
TRANS-3-HEXENE
1-HEPTENE
TRANS-2-HEPTENE
1-OCTENE
TRANS-4-OCTENE
2-METHYL-1-HEPTENE
2-OCTENE
1-NONENE
1-DECENE

CYCLOALKENES

CYCLOHEXENE
4-METHYLCYCLOHEXENE

ALKYNES

PROPYNE
1-BUTYNE

AROMATICS

BENZENE
TOLUENE
ETHYLBENZENE
M-XYLENE
P-XYLENE
STYRENE
O-XYLENE
ISOPROPYLBENZENE
PROPYLBENZENE
4-ETHYLTOLUENE
3-ETHYLTOLUENE
1,3,5-TRIMETHYLBENZENE
2-ETHYLTOLUENE
tert-BUTYLBENZENE
1,2,4-TRIMETHYLBENZENE
ISOBUTYLBENZENE
sec-BUTYLBENZENE
1,2,3-TRIMETHYLBENZENE
ISOPROPYL-4-METHYLBENZENE
INDAN
1,3-DIETHYLBENZENE
1,4-DIETHYLBENZENE
BUTYLBENZENE
1,2-DIETHYLBENZENE
T-DECALIN
C-DECALIN
1235-TETRAMETHYLBENZENE
1234-TETRAMETHYLBENZENE
1234-TETRAHYDRONAPHALENE
1,4-DIISOPROPYLBENZENE

CHLORINATED AROMATICS

CHLOROBENZENE
2-CHLOROTOLUENE
3-CHLOROTOLUENE
4-CHLOROTOLUENE
1,3-DICHLOROBENZENE
(CHLOROMETHYL) BENZENE
1,2-DICHLOROBENZENE

COMMON CONTAMINANTS ctd.

TOTAL HYDROCARBONS (THC, TH-M AND CH4)
MERCURY
OZONE
METEOROLOGICAL : WIND SPEED & DIRECTION
TEMPERATURE
DEW POINT TEMPERATURE
BAROMETRIC PRESSURE
SOLAR RADIATION

CHLORINATED ALKANES

CHLOROMETHANE
CHLOROETHANE
DICHLOROMETHANE
2-CHLORO-2-METHYLPROPANE
2-CHLOROBUTANE
TRICHLOROMETHANE
1,2-DICHLOROETHANE
1,1,1-TRICHLOROETHANE
1-CHLOROBUTANE
TETRACHLOROMETHANE
DIBROMOMETHANE
1,2-DICHLOROPROPANE
1-CHLORO-3-METHYLBUTANE
1-CHLOROPENTANE
1,1,2-TRICHLOROETHANE
1,3-DICHLOROPROPANE
1,2-DIBROMOMETHANE
1-CHLOROHEXANE
1,4-DICHLOROBUTANE
1,1,2,2-TETRACHLOROETHANE
1,2,3-TRICHLOROPROPANE
1,5-DICHLOROPENTANE
3-(CHLOROMETHYL)HEPTANE

CHLORINATED ALKENES

CHLOROETHENE
3-CHLOROPROPENE
trans-1,2-DICHLOROETHENE
cis-1,2-DICHLOROETHENE
3-CHLORO-2-METHYLPROPENE
2,3-DICHLOROPROPENE
TRICHLOROETHENE
TETRACHLOROETHENE
trans-1,4-DICHLORO-2-BUTENE

TABLE #3

Common Contaminant Data

Monitoring Period	Map ID	Start Time	Duration	Number GC Runs	Comments
A123	A	15:37	18.0 hrs	1	Overnight @ School
A132	B	11:31	4.0 hrs	4	Downwind PPG
A133	A	16:08	17.7 hrs	-	Overnight @ School
A183	A	15:27	18.5 hrs	-	Overnight @ School
A191	C	11:36	0.5 hrs	1	Upwind @ Lakeshore
A193	D	13:05	2.5 hrs	3	Downwind Lawson
A194	A	16:20	18.4 hrs	-	Overnight @ School
A202	A	12:42	22.0 hrs	-	Overnight @ School

Overall Average Ground Level Concentrations (ppm)

Monitoring Period	CO	TRS	SO2	THC	NOx	O3	NO2	Wind
A123	1.09	0.002	---	2.07	0.19	0.03	0.08	Calm
A132	1.20	---	0.006	2.96	0.07	0.07	0.06	1406
A133	0.89	---	0.003	2.34	0.04	0.06	0.04	Calm
A183	0.86	0.004	---	2.47	0.12	0.02	0.05	Calm
A191	15.32	0.004	---	3.63	0.23	0.02	0.09	1005
A193	0.25	0.004	---	2.14	0.03	0.06	0.02	1010
A194	1.04	0.003	---	2.75	0.13	0.03	0.07	Calm
A202	0.91	---	0.005	2.22	0.07	0.06	0.05	Calm

Maximum Half-Hour (MHH) Average Concentrations

Monitoring Period	CO	TRS	SO2	THC	NOx	O3	NO2
A123	2.69	0.010	---	2.94	0.52	0.09	0.19
A132	1.94	---	0.009	3.77	0.11	0.09	0.07
A133	1.41	0.003	---	3.26	0.07	0.10	0.06
A183	1.73	0.010	---	3.72	0.30	0.08	0.11
A191	17.55	0.004	---	3.85	0.23	0.02	0.09
A193	0.33	0.004	---	2.28	0.04	0.07	0.03
A194	2.09	0.003	---	4.08	0.34	0.07	0.14
A202	1.72	---	0.007	3.49	0.22	0.14	0.11

Wind aabb where aa is average direction to nearest 10 degrees and bb is average velocity in kilometers.

Monitoring Period Axxy where "A" refers to MAMu#1, "xx" the day of the month and "y" the run of the day.

Table 4

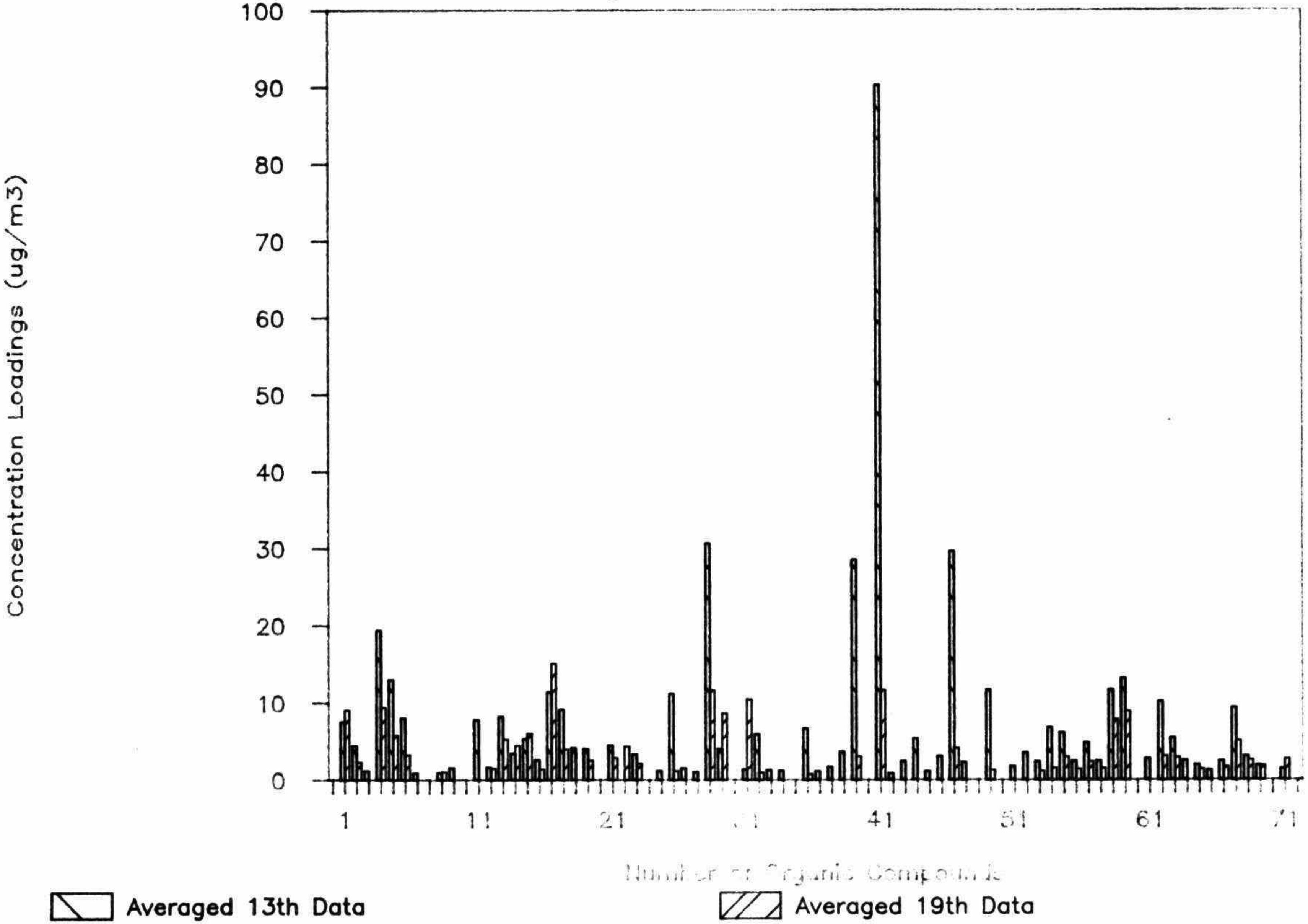
GAS CHROMATOGRAPHIC RESULTS ...... Ambient Air Survey near Brown's Line and the Lakeshore, Toronto
Data acquired by Mobile Air Monitoring Unit #1

	## Upwind ##	### Downwind of PPG Canada Limited ###					## Upwind ##	### Downwind Lawson Graphics ###			
	(at School)	(in Chrysler SW Parking lot)					(on Lakeshore)	(near SE corner of Chrysler Plant)			
	AUG 13	AUG 13	AUG 13	AUG 13	AUG 13		AUG 19	AUG 19	AUG 19	AUG 19	
	10:32	12:25	13:28	14:31	15:33	Average	12:15	13:40	14:49	15:50	Average
1 PROPANE	7.0	11.3	6.9	7.5	4.4	7.5	102.0	15.4	4.3	7.4	9.1
2-METHYLPROPANE		8.2	4.3	2.7	2.7	4.4	6.0	2.7	1.8	2.5	2.3
1-BUTENE	1.1	1.2				1.2					
BUTANE	48.2	34.9	19.2	11.6	11.8	19.4	25.8	10.8	7.2	10.4	9.5
2-METHYLBUTANE	28.9	25.2	11.9	7.8	7.1	13.0	20.5	7.0	4.1	6.4	5.8
PENTANE	18.0	15.8	7.4	4.5	4.4	8.0	19.9	4.0	2.2	3.7	3.3
TRANS-2-PENTENE	1.5	0.9				0.9	1.6				
2-METHYL-2-BUTENE							4.4				
2,2-DIMETHYLBUTANE		0.9				0.9	1.0	1.1			1.1
CYCLOPENTANE		1.5				1.5	1.2				
11 TRANS12DICHOROETHANE	8.3	7.8				7.8	6.0				
2,3-DIMETHYLBUTANE	1.8	1.6				1.6	2.0	2.1		0.9	1.5
2-METHYLPENTANE	9.2	8.2				8.2	13.4	9.5	2.5	3.8	5.3
3-METHYLPENTANE	6.9	6.3	3.5	2.0	1.9	3.4	8.9	8.6	2.5	2.3	4.5
HEXANE	9.7	8.2	6.1	3.1	3.8	5.3	20.1	11.7	2.6	3.7	6.0
METHYLCYCLOPENTANE	3.5	3.7	1.4			2.5	5.3	2.3	0.8	1.1	1.4
1,1,1-TRICHLOROETHANE	11.6	11.4				11.4				15.1	15.1
BENZENE	5.4	7.3	16.1	3.9		9.1	11.5	4.0		3.9	4.0
CYCLOHEXANE	0.8	1.3	8.6	2.4		4.1	1.7				
2,3-DIMETHYLPENTANE	3.8	4.0				4.0	10.0	3.5		1.6	2.5
21 2-METHYLHEXANE	4.3	4.5		4.4		4.5	11.4	4.1		1.8	2.9
DIBROMOMETHANE									4.4		4.4
3-METHYLHEXANE	3.2	3.3		3.3		3.3	8.0	3.0		1.3	2.1
2,3-DICHLOROPROPENE							4.9				
2,2,4-TRIMETHYLPENTANE	1.9	1.5	1.4	0.7	0.9	1.1	3.1				
HEPTANE	2.5	3.8	19.7	5.8	15.4	11.2	10.0	1.5		0.9	1.2
4-METHYLCYCLOHEXENE			1.5			1.5	1.8				
2,5-DIMETHYLHEXANE		0.7	1.3		0.9	0.9	1.8				
TOLUENE	15.3	25.3	36.9	22.3	38.1	30.6	145.7	11.3		12.0	11.6
2-METHYLHEPTANE	0.9	2.5	6.6	2.2	4.7	4.0	4.6			8.7	8.7
31 4-METHYLHEPTANE		1.0	2.0	0.7	1.6	1.3	2.4			10.5	10.5
3-METHYLHEPTANE	1.6	4.6	8.9	3.8	6.4	5.9	9.0	0.9		1.0	0.9
1-OCTENE		0.8	2.1	0.8	1.3	1.3	1.0				
TRANS12DIMETHYLCYCLOHEXAN		0.8	2.1	0.6	1.2	1.2	1.0				
TETRACHLOROETHENE	2.8						3.1				
OCTANE	1.6	5.1	11.6	3.5	6.5	6.7	6.5			0.8	0.8
CIS12DIMETHYLCYCLOHEXAN			1.1			1.1	0.8				
ETHYLCYCLOHEXANE		1.4	2.9	0.9	1.4	1.7	1.8				
PROPYLCYCLOPENTANE		3.1	6.4	2.0	3.2	3.7	3.9				
ETHYLBENZENE	3.1	21.3	36.3	22.8	33.5	28.5	22.5	3.7	2.0	3.5	3.1
41 M-XYLENE	7.2	67.5	109.2	77.4	106.8	90.2	82.0	15.0	6.6	13.3	11.6
4-METHYLOCTANE				0.6	1.0	0.8					
2-METHYLOCTANE		2.0	4.7	1.0	1.8	2.4	4.1				
STYRENE			8.2		2.5	5.4	4.0				

Table 4 ctd.

GAS CHROMATOGRAPHIC RESULTS ...... Ambient Air Survey near Brown's Line and the Lakeshore, Toronto
Data acquired by Mobile Air Monitoring Unit #1

	## Upwind ##	#### Downwind of PPG Canada Limited ####					## Upwind ##	#### Downwind Lawson Graphics ####			
	(at School)	(in Chrysler SW Parking lot)					(on Lakeshore)	(near SE corner of Chrysler Plant)			
	AUG 13	AUG 13	AUG 13	AUG 13	AUG 13		AUG 19	AUG 19	AUG 19	AUG 19	
	10:32	12:25	13:28	14:31	15:33	Average	12:15	13:40	14:49	15:50	Average
3METHYLOCTANE		1.2			1.1	1.1	2.0				
1,4-DICHLOROBUTANE			4.9		1.3	3.1					
O-XYLENE	2.6	23.3	39.5	21.7	34.0	29.6	25.0	5.2	2.8	4.6	4.2
1,2,3-TRICHLOROPROPANE				2.3		2.3					
1-NONENE							1.7				
NONANE	1.0	7.5	26.3	4.4	8.4	11.7	14.6	1.2		1.4	1.3
51 ISOPROPYLBENZENE			1.7			1.7	1.5				
2-CHLOROTOLUENE		2.7	7.6	1.1	2.8	3.5	4.7				
N-PROPYLBENZENE	0.8	2.2	4.2	1.0	2.0	2.3	5.3	1.4	1.0		1.2
4-CHLOROTOLUENE			6.8			6.8				1.6	1.6
3-ETHYLTOLUENE	1.5	5.9	11.4	2.6	4.6	6.1	13.4	3.5	2.5		3.0
4-ETHYLTOLUENE	0.6	2.2	4.6	1.1	1.7	2.4	5.2	1.5	1.0	1.7	1.4
1,3,5-TRIMETHYLBENZENE	1.1	6.3		2.9	5.0	4.7	10.7	3.0	1.8		2.4
2-ETHYLTOLUENE	0.7	3.0		1.7	2.6	2.4	6.1	1.9	1.2		1.5
1,2,4-TRIMETHYLBENZENE	2.3	11.1	20.6	6.3	8.6	11.6	20.5	9.1	5.3	9.3	7.9
tert-BUTYLBENZENE	3.0	10.1	27.0	5.1	10.3	13.1	26.2	6.8	6.8	13.2	8.9
61 1ISOBUTYLBENZENE		2.7				2.7					
DECANE	1.5	7.9	19.9	4.0	8.5	10.1	19.9	4.6	1.7	3.2	3.1
1,2,3-TRIMETHYLBENZENE	1.1	5.7	10.3	3.3	2.2	5.4	6.1	3.8	2.1		2.9
1,2-DICHLOROBENZENE		2.8	4.6	1.4	1.3	2.5					
INDAN		2.1	3.0	1.4	1.4	1.9	4.8	1.7	1.1	1.5	1.4
1,3-DIETHYLBENZENE		1.3				1.3	1.2				
1,4-DIETHYLBENZENE		2.6	4.3	1.5	1.3	2.4	2.8	1.7		1.7	1.7
UNDECANE	2.0	7.7	17.5	5.6	6.6	9.3	11.9	7.0	3.1	5.4	5.1
1235-TETRAMETHYLBENZENE		3.1	4.1	2.6	2.5	3.1	2.7	2.7	1.8	3.3	2.6
1234-TETRAMETHYLBENZENE		2.1	2.8	1.4	1.2	1.9	2.1	2.2	1.1	2.3	1.9
71 DODECANE		1.8	1.7	1.3	1.0	1.4	1.1	3.0	1.4	3.7	2.7
Total Compounds Identified	39	58	48	46	45	49	62	37	27	36	33
Total # of Peaks	59	126	138	92	113	117	131	61	42	72	58
Total Area of Peaks	20244	19322	30870	12986	19185	20591	31761	8732	3965	8154	6950
Area of Identified Peaks	16458	15597	21745	11533	15188	16015	29567	7571	3526	6469	5855
Area % Identified Peaks	81	81	70	89	79	80	93	87	89	79	85
Total Hydrocarbons ug/m3	227.9	423.7	570.5	270.6	371.4	409.1	784.1	182.2	75.4	169.4	142.3
Alkanes ug/m3	154.8	184.9	204.8	84.0	106.5	145.1	350.2	102.7	33.3	72.2	69.4
Cycloalkanes ug/m3	4.4	11.9	22.5	5.9	5.8	11.5	15.6	2.3	0.8	1.1	1.4
Alkenes ug/m3	2.5	2.9	2.1	0.8	1.3	1.8	8.7	0.0	0.0	0.0	0.0
Cycloalkenes ug/m3	0.0	0.0	1.5	0.0	0.0	0.4	1.8	0.0	0.0	0.0	0.0
Alkynes ug/m3	0.0	0.0	0.0	0.0	0.0	0.0	4.4	0.0	0.0	0.0	0.0
Aromatics ug/m3	44.6	204.8	340.1	178.8	258.2	245.5	399.3	78.4	36.9	70.4	61.9
Chlorinated alkanes ug/m3	11.6	11.4	4.9	2.3	1.3	5.0	0.0	0.0	4.4	15.1	6.5
Chlorinated alkenes ug/m3	11.1	7.8	0.0	0.0	0.0	2.0	14.0	0.0	0.0	0.0	0.0
Chlorinated aromatics ug/m3	0.0	5.5	18.9	2.5	4.1	7.7	4.7	0.0	0.0	1.6	0.5
Toluene:Ethylbenzene	4.9	1.2	1.0	1.0	1.1	1.1	6.5	3.1	0.0	3.4	2.2
Benzene:Ethylbenzene	1.7	0.3	0.4	0.2	0.0	0.2	0.5	1.1	0.0	1.1	0.7
Xylenes:Ethylbenzene	3.1	4.3	4.1	4.3	4.2	4.2	4.8	5.5	4.6	5.1	5.1



PPG & Graphics

Averaged Downwind GC Data – August 1986

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